

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (currently amended) A microreactor comprising:

a plurality of separate reaction microchannels at least one etched microchannel structure within a silicon substrate, each reaction microchannel having at least one inlet and at least one outlet,

at least one integrated catalytic microcombustion heater of the reaction microchannels comprising a steam reformer for a hydrogen-containing fuel having a reforming catalyst material between the at least one inlet and the at least one outlet, and

at least one other of the reaction microchannels comprising an integrated catalytic microcombustion heater having at least one heater catalyst material between said the at least one inlet and said the at least one outlet,

wherein at least one of the at least one inlet and the at least one outlet for each of the plurality of separate reaction microchannels is an additional non-reaction microchannel oriented non-parallel to the corresponding reaction microchannel,

whereby a fully integrated silicon chemically heated steam reforming microreactor that maintains gas separation between the reformer and heater microchannels is provided.

2. (currently amended) The microreactor of claim 1, further comprising:

at least one porous membrane located between said reformer inlet and said outlet.

3. (original) The microreactor of claim 1, wherein said catalyst material is selected from the group consisting of platinum, platinum-ruthenium, nickel, palladium, copper, copper oxide, ceria, zinc oxide, alumina, combinations thereof and alloys thereof.

4-5. (canceled)

6. (currently amended) The microreactor of claim 1, wherein the said reformer outlet connects to a manifold of a fuel cell.

7. (currently amended) The microreactor of claim 1, wherein said at least one catalyst material located between said inlet and said outlet is packed into said reformer microchannel.

8. (currently amended) The microreactor of claim 2, wherein said at least one catalyst material located between said inlet and said outlet are imbedded in said porous membrane in said reformer microchannel.

9. (currently amended) The microreactor of claim 1, wherein said reformer microchannel inlet connects to a liquid fuel reservoir.

10. (currently amended) The microreactor of claim 2, wherein said reformer microchannel is interfaced with said porous membrane such that fuel flow moves in a horizontal direction from said reformer microchannel inlet through said reformer microchannel and moves in a vertical direction from said reformer microchannel through said reformer microchannel outlet.

11-12. (canceled)

13. (original) The microreactor of claim 1, wherein said heater is integrated at said inlet.

14. (currently amended) The microreactor of claim 1, wherein said heater is integrated along said reformer microchannel.

15. (original) The microreactor of claim 2, wherein said heater is integrated at said porous membrane.

16. (original) The microreactor of claim 2, wherein said porous membrane comprises a porous thick film selected from the group consisting of porous silicon, anodic alumina, zerogel, glass and combinations thereof.

17. (original) The microreactor of claim 2, wherein the catalyst material covers a surface area of the porous membrane measuring about $1\text{m}^2/\text{cm}^3$ or greater.

18. (previously amended) The microreactor of claim 1, wherein the microchannels support a fuel flow rate in the range of about 1 microliter/minute to about 600 microliters/minute.

19. (original) The microreactor of claim 2, further comprising:

a porous getter structure located at the exit side of said porous membrane.

20. (original) The microreactor of claim 19, wherein the surface area and volume of the getter structure is about $1\text{m}^2/\text{cm}^3$ or greater.

21. (previously amended) The microreactor of claim 1, wherein said microreactor is configured to process more than one type of liquid fuel component into hydrogen fuel.

22. (currently amended) A microreactor comprising:

at least a top silicon substrate and a bottom silicon substrate such that a plurality of separate capillary microchannels ~~at least one capillary microchannel is~~ are contained between said at least top substrate and said bottom substrate, ~~said each~~ capillary microchannel having at least one inlet and at least one outlet,

a plurality of catalyst materials located between ~~said the at least one~~ inlet and ~~said the at least one~~ outlet of at least one of the microchannels comprising a hydrogen-containing fuel steam reformer,

at least one porous membrane located at ~~said the at least one reformer microchannel~~ outlet, and

at least one other of the microchannels comprising an integrated catalytic microcombustion heater between the at less one inlet and the at least one outlet,

whereby a fully integrated silicon chemically heated steam reforming microreactor that maintains gas separation between the reformer and heater microchannels is provided.

23. (currently amended) The microreactor of claim 22, wherein said plurality of catalyst materials located between said inlet and said outlet are packed into said reformer microchannel.

24. (currently amended) The microreactor of claim 22, wherein said catalyst materials located between said inlet and said outlet of said reformer microchannel are imbedded in said porous membrane.

25. (currently amended) The microreactor of claim 22, wherein said reformer capillary microchannel is interfaced with said porous membrane such that ~~the~~ fuel flow moves in a horizontal direction from said inlet through said microchannel and moves in a vertical direction from said microchannel through said outlet.

26. (currently amended) The microreactor of claim 22, wherein the said reformer microchannel outlet is connected to a manifold of a fuel cell.

27. (previously amended) The microreactor of claim 22, wherein said plurality of catalyst materials are selected from the group consisting of platinum, platinum-ruthenium, nickel, palladium, copper, copper oxide, ceria, zinc oxide, alumina, combinations thereof and alloys thereof.

28-41. (canceled)